

Tree Species Enumeration of 0.5 Hectare on Halmahera

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Abstract

A plot of 0.5 ha in east central Halmahera in the Moluccas had 76 species, 31 families and 371 stems of trees ≥ 10 cm dbh. It differed substantially from plots enumerated previously in Seram.

It is well known that within Malesia once one crosses Wallace's Line eastwards the tree flora becomes poorer. Many rain forests in fact show greater richness in the western (Sumatra, Malaya, Borneo) and eastern (New Guinea) regions of the archipelago than in the centre (Sulawesi and the Moluccas), and some groups are very rich in species at either west or east. These aspects of floristics are reflected by tree-species numbers on small plots.

There are a few counts which show some very rich forests in western Malesia; the largest counts ever recorded for rain forest come from Sarawak (223, 214 species/hectare of trees ≥ 10 cm dbh; Proctor *et al.* 1983). For Kalimantan there are records of 149, 129 and 128 spp./ha (Kartawinata *et al.*, 1981), while for Papua c. 184, c. 181, c. 152, c. 145 spp./ha have been recorded (extrapolated from plots of 0.8 ha area; Paijmans, 1970). There are very few counts from central Malesia.

The exact location and shape of a small plot is likely to affect the number of species counted. Shortage of time has invariably prevented workers from simply adding more subplots to reach the asymptote of the species-area curve. This measure of abundance in species is thus not entirely satisfactory, but an accumulation of plot counts from different places will eventually give some fairly objective data on forest composition.

Thus, we offer here the first enumeration made on Halmahera, an island in north Moluccas, as a modest contribution to forest quantification.

The site lay on a broad ridge crest at 630 m over shale at 0°30'N, 125°30'E, near the logging camp at Tapayo, 20 km southeast of Dodinga on Telok Kau, on the central mountainous spine of the northeastern peninsula. The soil was a shallow reddish clay only c. 40 cm thick. The surface had a continuous thin leaf litter. The tallest trees were c. 40 m. Big woody climbers were rare. Most boles were clean of epiphytes and of adherent climbers (of which the most abundant were two *Freycinetia* spp. both only 'occasional'). There was a dense seedling carpet. The forest was mostly in the mature phase of the growth cycle, with a few small gaps formed by one or two fallen trees (Fig. 1). Otherwise big trees were 'dying on their feet', disintegrating *in situ*, and forming virtually no gaps.

The whole region had been recently heavily logged and we were only able to find a homogeneous intact patch of less than one hectare. Within this patch we enumerated all trees ≥ 10 cm dbh on a single half-hectare plot, made up of 11 subplots of 0.04 ha plus 3 of 0.02 ha (Fig. 1).

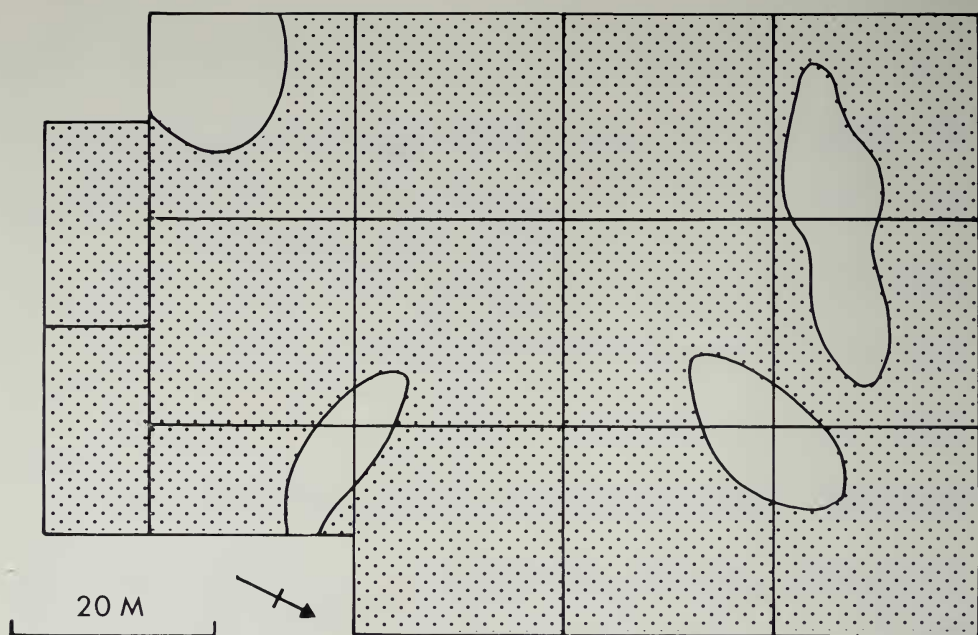


Fig. 1. Plot layout and forest phase diagram. Gap-phase forest is left unshaded. Rest is mature phase.

In Fig. 2 we present the species-area curve, which shows signs of flattening out. In Table 1 we present a summary of floristics. Myrtaceae, Guttiferae and Lauraceae dominate the forest both in terms of species and stem numbers. We had a total of 76 species in 31 families on the half hectare, and 371 stems.

The only other published plots we know of for the Moluccas were enumerated on Seram island. There, on an area of 8 ha, comprising four transects each $20 \times 1000\text{m}$, only 54 species in 27 families were encountered (Sidiyasa & Tantra 1984). Such long belt transects are likely to maximise species recorded because of their length,

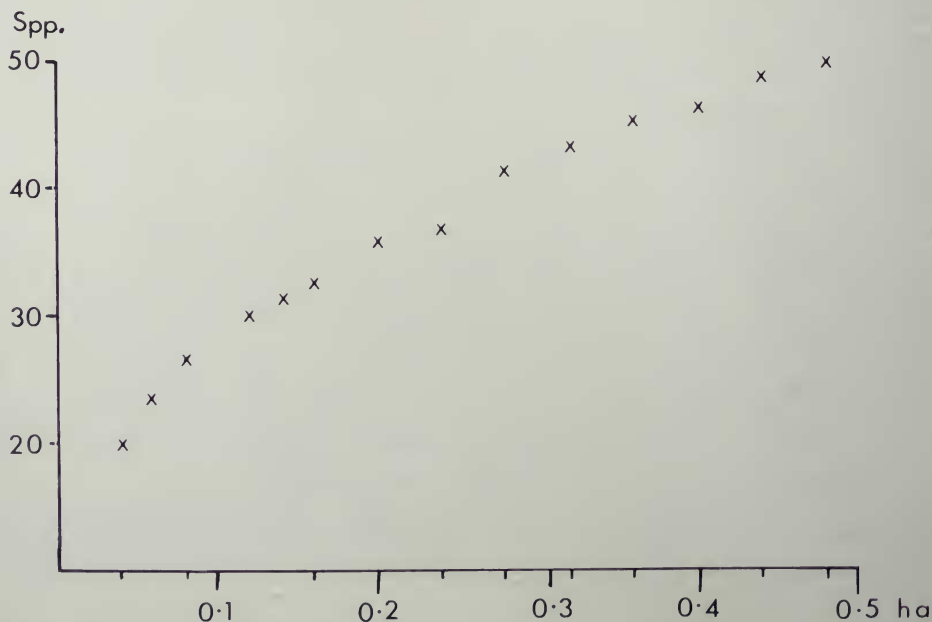


Fig. 2. Species-area curve.

Table 1. Families in descending sequence of abundance on the 0.5 ha plot.
(For species authorities see Whitmore & Tantra in press)

		Total species	Total stems
Myrtaceae	11 <i>Eugenia</i> spp. (30 + 7 + 9 × 1)	11	46
Guttiferae	<i>Calophyllum soulattri</i> (23 stems)		
	3 <i>Calophyllum</i> spp. (35 + 3 + 1)		
	<i>Garcinia celebica</i> (31)		
	4 <i>Garcinia</i> spp. (6 + 3 + 1 + 1)	9	104
Lauraceae	<i>Cryptocarya</i> sp. (1)		
	<i>Endiandra rubescens</i> (11)		
	2 <i>Litsea</i> spp. (9 + 7)		
	3 Lauraceae indet. (1 + 1 + 1)	7	31
Burseraceae	<i>Canarium vulgare</i> (1)		
	2 <i>Canarium</i> spp. (23 + 1)		
	<i>Santiria</i> sp. (1)		
	2 Burseraceae indet. (2 + 1)	6	29
Myristicaceae	<i>Gymnacranthera forbesii</i> (3)		
	<i>Gymnacranthera</i> sp. (1)		
	<i>Horsfieldia</i> sp. (5)		
	<i>Myristica</i> sp. (7)		
	Myristicaceae indet. (2)	5	18
Euphorbiaceae	<i>Blumeodendron</i> sp. (1)		
	<i>Macaranga</i> sp. TCW 3621 (28)		
	<i>Macaranga</i> sp. TCW 3680 (2)	3	31
Theaceae	<i>Adinandra</i> sp. (1)		
	<i>Laplacea</i> sp. (3)		
	<i>Ternstroemia</i> sp. TCW 3669 (4)	3	8
Anacardiaceae	<i>Dracontomelon dao</i> (1)		
	<i>Gluta</i> sp. (1)		
	<i>Semecarpus</i> sp. (1)	3	3
Rubiaceae	<i>Gardenia</i> sp. (1)		
	<i>Nauclea mitragyna</i> (1)		
	<i>Nauclea</i> sp. (2)	3	4
Fagaceae	<i>Castanopsis buruana</i> (6)		
	<i>Lithocarpus celebicus</i> (17)	2	23
Sapindaceae	<i>Pometia pinnata</i> (4)		
	Sapindaceae indet. (1)	2	5
Dilleniaceae	2 <i>Dillenia</i> spp. (3 + 1)	2	4
Leguminosae	<i>Archidendron</i> sp. (2)		
	<i>Cynometra ramiflora</i> (1)	2	3
Meliaceae	<i>Aphanamixis polystachya</i> (1)		
	<i>Aphanamixis</i> sp. (2)	2	3
Araucariaceae	<i>Agathis dammara</i> (11)	1	11
Dipterocarpaceae	<i>Anisoptera thurifera</i> (10)	1	10
Melastomataceae	<i>Memecylon</i> sp. (9)	1	9
Celastraceae	<i>Lophopetalum</i> sp. (4)	1	4
Ebenaceae	<i>Diospyros lolin</i> (4)	1	4
Juglandaceae	<i>Engelhardtia serrata</i> (4)	1	4
Sapotaceae	<i>Planchonella moluccana</i> (3)	1	3
Cunoniaceae	<i>Schizomeria serrata</i> (2)	1	2
Flacourtiaceae	Flacourtiaceae indet. (2)	1	2
Palmae	<i>Pinanga ternatensis</i> Scheff. (2)	1	2
Ulmaceae	<i>Gironniera subaequalis</i> (2)	1	2
Annonaceae	<i>Popowia</i> sp. TCW 3605 (1)	1	1
Elaeocarpaceae	<i>Elaeocarpus</i> sp. (1)	1	1
Lecythidaceae	<i>Barringtonia</i> sp. TCW 3639 (1)	1	1
Moraceae	<i>Ficus</i> sp. TCW 3642 (1)	1	1
Rhizophoraceae	<i>Gynotroches axillaris</i> (13)	1	1
Rosaceae	<i>Maranthes corymbosa</i> (1)	1	1
TOTALS	31 families	76 species	371 stems

Voucher specimens either deposited at BZF (most are solely fallen leaves) or, for TCW collection series, at BO, BZF, K and L.

in contrast to compact plots. On the Seram plots no family was well represented. Myrtaceae (6 species), Euphorbiaceae (5 species) and Ebenaceae, Guttiferae, Moraceae, Sapotaceae and Sterculiaceae (3 species each) were richest.

Both sites lie in rain forest climates, types A (Halmahera) and B (Seram) in the Schmidt & Ferguson (1951) scheme (see map Fig. 4.1 in Whitmore 1984). Neither forest had any noticeable seasonal-climate floristic element.

Stem number on our plot at 742/ha is high in comparison with most rain forests. The Seram plot at 390 stems/ha is about average (see Table 1 in Whitmore & Sidiyasa 1986).

The Halmahera and Seram samples are very different from each other. In the long term, interpretation of variation in forests between different parts of Malesia needs some kind of quantitative data base, towards which we publish this enumeration.

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